

North American Hydro Contracting, LLC
2601 East Hubbard Road
Kuna, ID 83634
Tel: 208-288-1057 Fax: 846-8736
Email: henry.huber@nahydro.com



Engineering & Manufacturing:
8310 Technology Drive
Schofield, WI 54476 USA
Tel: 715-359-0209 Fax: 1049
Email: schofield@nahydro.com

Plant Operations: P.O. Box 167 Neshkoro, WI 54960 Tel: 920-293-4628 Fax: 8087 Email: nah@nahydro.com
Please Visit Our Web Site www.nahydro.com

MARCH 14, 2007

Barren County Soil and Water Conservation Department
(Agriculture Service Center)
c/o Mr. Dale Hanson, Dam Coordinator
330 East LaSalle Ave., Room 221
Barron, WI 54812

Dear Sir:

North American Hydro ("NAH") was retained to prepare a reconnaissance report on the viability of restoring the Chetek hydro plant. This plant is located at the Chetek Dam in City of Chetek, Barron County, WI. Below is a summary of the actions taken, the analysis and conclusions reached.

Actions

On October 27, 2005 NAH representative Richard Shear visited the site with Mr. Hanson. The attached photos of the existing dam and waterway were taken at that time. On July 5, 2006 Barron County authorized North American Hydro to prepare a proposal to study the feasibility of restoring the non-operating hydro plant to production.

Since then NAH reviewed the Chetek Hydropower Project Feasibility Study prepared by the Wisconsin Division of State Energy apparently in the early 1980's. NAH also reviewed the Application for Preliminary Permit prepared in 1985. Finally, in January 2007 NAH retained Hydro Development Services to inspect the property and prepare an estimate of the cost to refurbish this hydroelectric plant. At which time the interior pictures were taken.

Analysis

In general, a hydro plant is viable if the present value of the power generated exceeds the development cost. The first step in calculating the value is to determine how much power will be generated each year. The power potential is a function of the water flow, the head and the system efficiency. The WIDSE Feasibility report provided the flow duration curve, which we have assumed has not changed since the 1980's. Other pertinent equipment details were taken during the site visits and from other reports prepared in the past. Based on this information, annual generation is estimated to be 570,000 kWh. Below is a summary of this production estimate:



Assumptions

Rated kW	250
Rated head	10.0
CFS	369

Production:

%	CFS	TWEL	Head	kW	kWH
0%	1,000	89.0	6.8	170	74
5%	360	85.4	10.4	254	111
10%	230	84.9	10.9	170	74
15%	187	84.7	11.1	141	62
20%	160	84.5	11.3	122	53
25%	110	84.4	11.4	85	37
30%	130	84.3	11.5	101	44
40%	110	84.2	11.6	86	38
50%	92	84.0	11.8	74	32
60%	80	83.9	11.9	64	28
70%	70	83.8	11.0	52	23
80%	60	83.7	12.1	49	21
90%	51	83.6	12.2		
100%	40	83.4	12.4		

Total	599
Station use and unplanned losses	(30)
Net Production	569

It is notable that the Preliminary Permit used a stabilized production of 650 MWH based on an average flow of 127 cfs. Accordingly, it is probably safe to say that the reasonable range of stabilized production is 569 – 650 MWH.

There are two sources for the estimated refurbishment cost – (1) the WDSE study in 1981 and (2) the HDS analysis in 2007. Below is a comparison of the WDSE numbers inflated to 2007 alongside the HDS estimate:

	WDSE in 1981	WDSE inflated to 2007	HDS in 2007
Feasibility study	\$ 20,000	\$ 46,000	
FERC license	-	154,000	150,000
Dam+PH repairs	-	25,000	120,000
Constr. Mgmt	20,000	46,000	60,000
Coffer dam	50,000	75,000	
Trb/gen/gvnr	200,000	230,000	280,000
Swichgr+cntrls	20,000	35,000	45,000
Subtotal	310,000	611,000	655,000
Studies, financing, contingency	62,000	122,200	132,000
Total	\$ 372,000	\$ 733,200	\$ 787,000



Based on the above analysis, it is safe to conclude that the total rehabilitation cost will be in the \$730,000 to \$790,000 range. If the City can borrow money at the tax-exempt rate of 5.0%, then the annual debt service constant will be 8.02% of the loan amount assuming a 20 year amortization. Assuming 100% of the rehabilitation cost is borrowed, then annual debt service will be \$58,600 to \$63,400. This debt service is \$90 - \$111 per MWH depending on stabilized production. Annual expenses for the hydro plant will total \$30-40,000 per year or \$45 - \$70 per MWH. Total revenues must at least equal both annual expenses and debt service. Therefore, revenues must total \$135 - \$170 per MWH in order to for this project to be viable.

Conclusions

It appears that this project is not economically viable because the development cost will exceed its value at current wholesale electric rates. For this project to approach viability, the required electric rate must exceed \$150 per MWH, which may be achieved by taking advantage of utility and government programs designed to advance renewable energy. We did not undertake an examination of these programs because it was beyond the scope of this report. We hope this report meets with your approval and are happy to answer any questions you may have.

Sincerely yours,
NORTH AMERICAN HYDRO

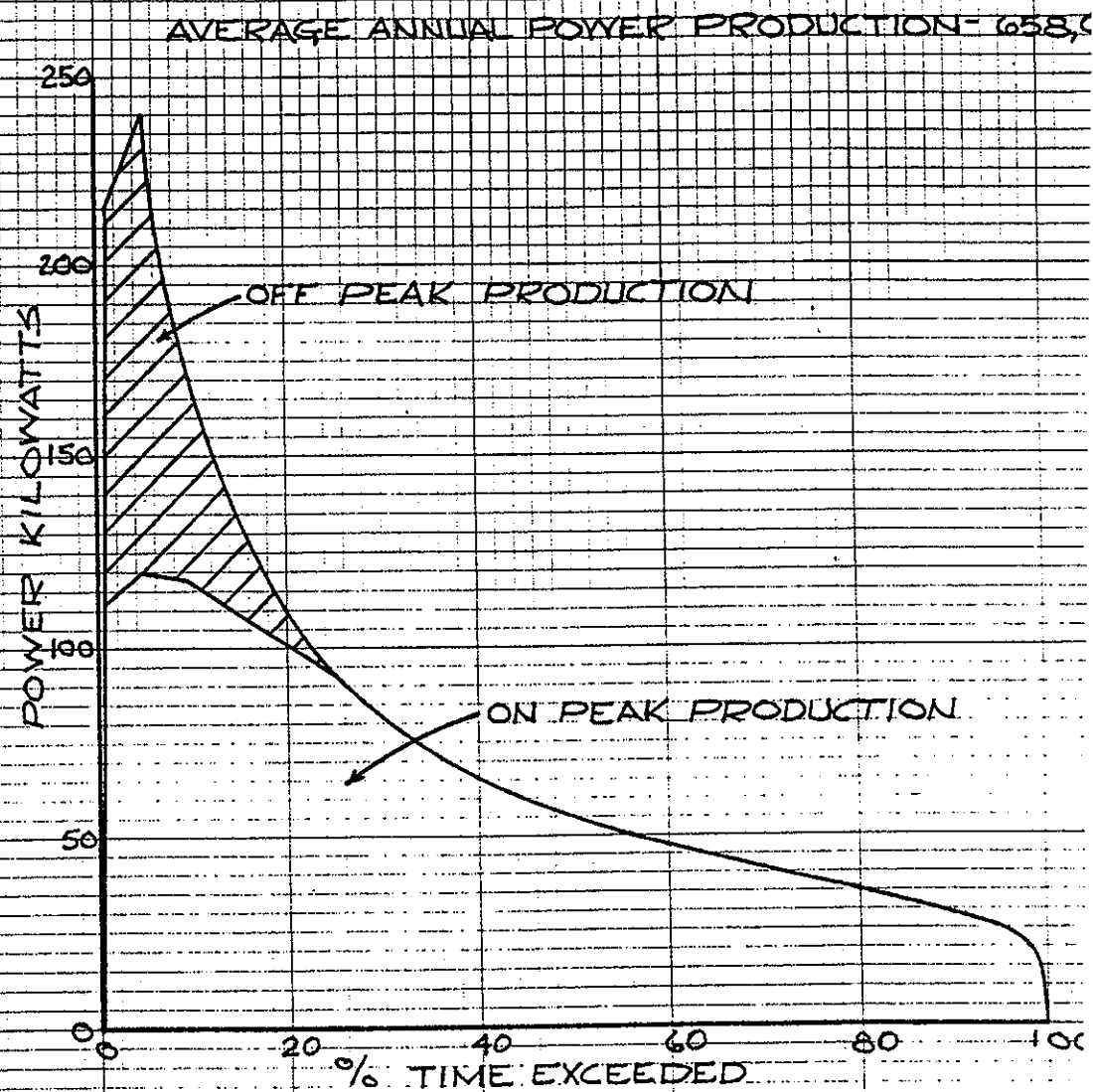
A handwritten signature in dark ink, appearing to read "W. Pickrell", is written over the company name.

William H. Pickrell
Senior Vice President

14 attachments

46 0700

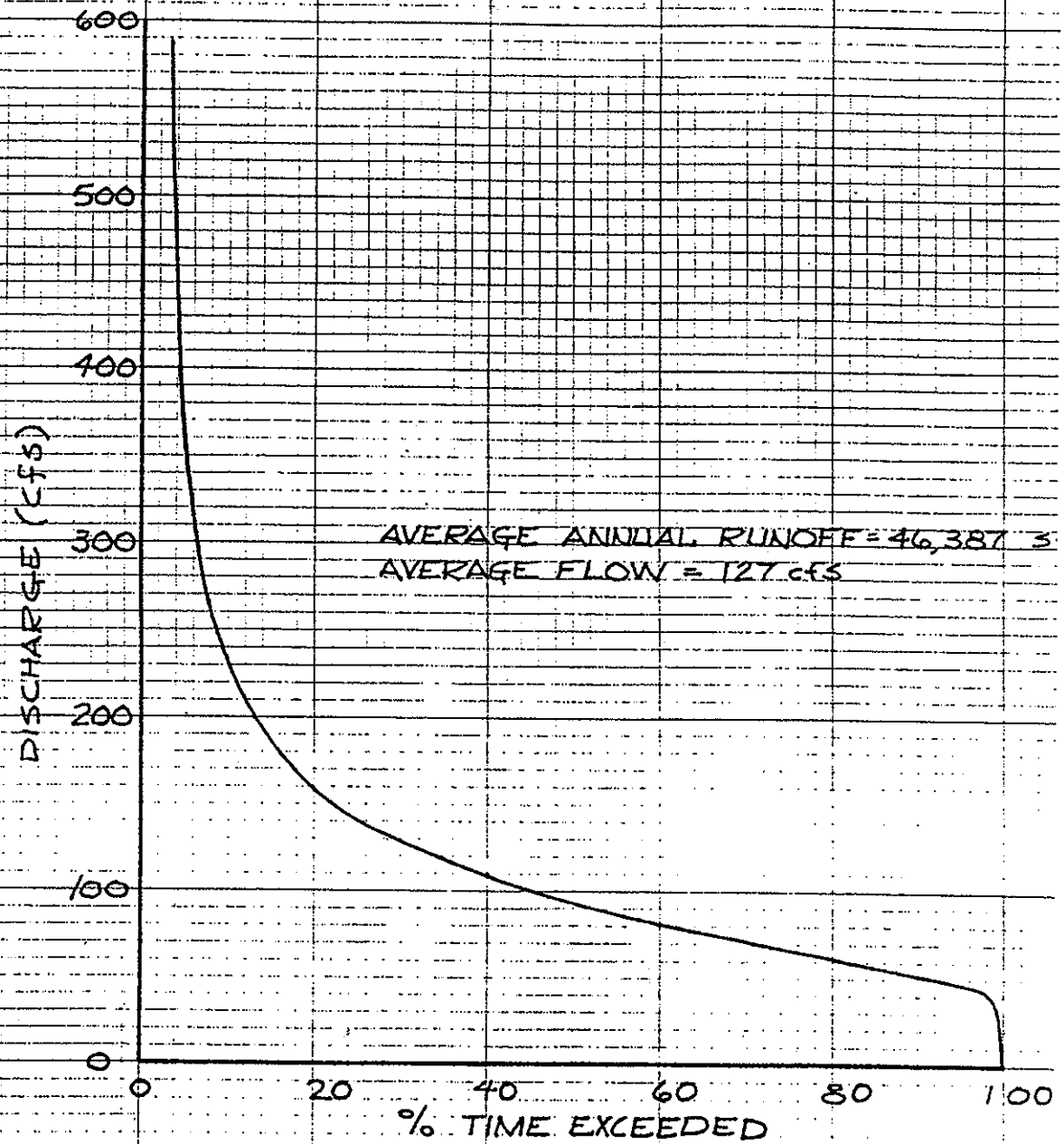
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



AVERAGE ANNUAL ENERGY
CHETEK DAM
CHETEK, WISCONSIN

46 0700

10 X 10 TO THE INCH • / X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



DISCHARGE - DURATION CUR
CHETEK RIVER
CHETEK, WISCONSIN
D.A = 194 SQ. MI

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North American Hydro Holdings, Inc. — Plant Operations:

116 State Street, P.O. Box 167, Neshkoro, WI 54960 USA
Tel 920-293-4628 Fax 920-293-8087 Email nah@nahydro.com Web www.nahydro.com

Engineering & Manufacturing:

8310 Technology Drive, Weston, WI 54476 USA
Tel 715-359-0209 Fax 715-359-1049 Email schofield@nahydro.com Web www.nahydro.com

June 28, 2007

Barron County Soil and Water Conservation Department
(Agriculture Service Center)
c/o Mr. Dale Hanson, Dam Coordinator
330 East LaSalle Ave., Room 221
Barron, WI 54812

Dear Sir:

North American Hydro ("NAH") prepared a reconnaissance report on February 28, 2007 for the Chetek Dam. That report reviewed the viability of restoring the existing hydroelectric power plant. The conclusion was that restoration was not viable at this time. This supplement to the reconnaissance report explores the alternative of adding a low-flow hydroelectric unit at the dam rather than restore the existing powerhouse.

A low-flow unit is one that is sized to run 100% of the time. Therefore, its hydraulic capacity is typically at 70-80% of the flow duration curve. At the Chetek Dam this capacity is 60-70 cfs, which translates into a 40 kW unit at 10 ft. of head. This size unit would yield about 250 MWH as summarized below:

<u>%</u>	<u>CFS</u>	<u>TWEL</u>	<u>Head</u>	<u>KW</u>	<u>KWH</u>
0%	1,000	89.0	6.8	27.0	11.8
5%	360	85.4	10.4	42.0	18.4
10%	230	84.9	10.9	44.0	19.3
15%	187	84.7	11.1	44.0	19.3
20%	160	84.5	11.3	45.0	19.7
25%	140	84.4	11.4	46.0	20.1
30%	130	84.3	11.5	46.0	20.1
40%	110	84.2	11.6	46.0	20.1
50%	92	84.0	11.8	47.0	20.6
60%	80	83.9	11.9	48.0	21.0
70%	70	83.8	11.0	44.0	19.3
80%	60	83.7	12.1	46.0	20.1
90%	51	83.6	12.2	40.0	17.5
100%	40	83.4	12.4	31.0	13.6
Total					261.0
Station use and unplanned losses					(10.4)
Net Production					250.6

The cost to develop this unit is about \$150,000 as set forth on the attached report from Hydro Development Services, LLC. In order to estimate the annual cost to support this low-flow unit, it is necessary to make some key assumptions about regulatory



license is required and that the hydro is owned by a government agency -- then the annual costs will be as follows:

Cost		
Feasibility study	-	
FERC license	-	
Dam + PH repairs	-	
Constr. Mgmt	-	
Coffer dam	-	
Turbine	\$15,000	
Generator	25,000	
Electrical	25,000	
Mechanical	50,000	
Syphon piping	35,000	
Swichgr+cntrls	-	
Subtotal	150,000	
Contingency	-	
Total	150,000	
Required return	8.02%	
Annual Debt Service		\$ 12,036
Expenses		
Wages	1,200	
Maint	1,000	
Repair reserve - turbine	600	
Repair reserve - generator	1,250	
Repair reserve - controls	1,000	
Supplies	250	
Taxes	-	
Insurance	-	
Metering	-	
Regulatory	-	
Utilities	-	
Miscellaneous	-	
Direct Costs	5,300	
Engineering + G&A	-	
Total Expense		5,300
Required Revenues		\$17,336

The above required revenue is equivalent to \$69.18 PMWH. The current wholesale market price for power is about \$45 PMWH. If the hydro unit was privately owned, then tax incentives would be available, but the benefit would be dissipated by higher operating expenses. Renewable energy credits offer future hope for revenue, but none are available today in any material amount.



All things considered this project does not appear viable at this time. The basic problem in this case is that the hydraulic head is too low for commercial hydro production. The higher head increases production geometrically with very little change in cost. So the head really needs to be at least 15 ft. for a project like this to be viable.

Sincerely yours,

NORTH AMERICAN HYDRO

A handwritten signature in black ink, appearing to read "W. H. Pickrell". The signature is fluid and cursive, with a large initial "W" and a long, sweeping underline.

William H. Pickrell



Hydroelectric Development Services, LLC

PO Box 214 . Norway MI 49870 . (906) 563-9334 . Fax (906) 563-9344

Bill Pickrell
North American Hydro
PO Box 167
Neshkoro, WI 54960

7/21/07

Bill,

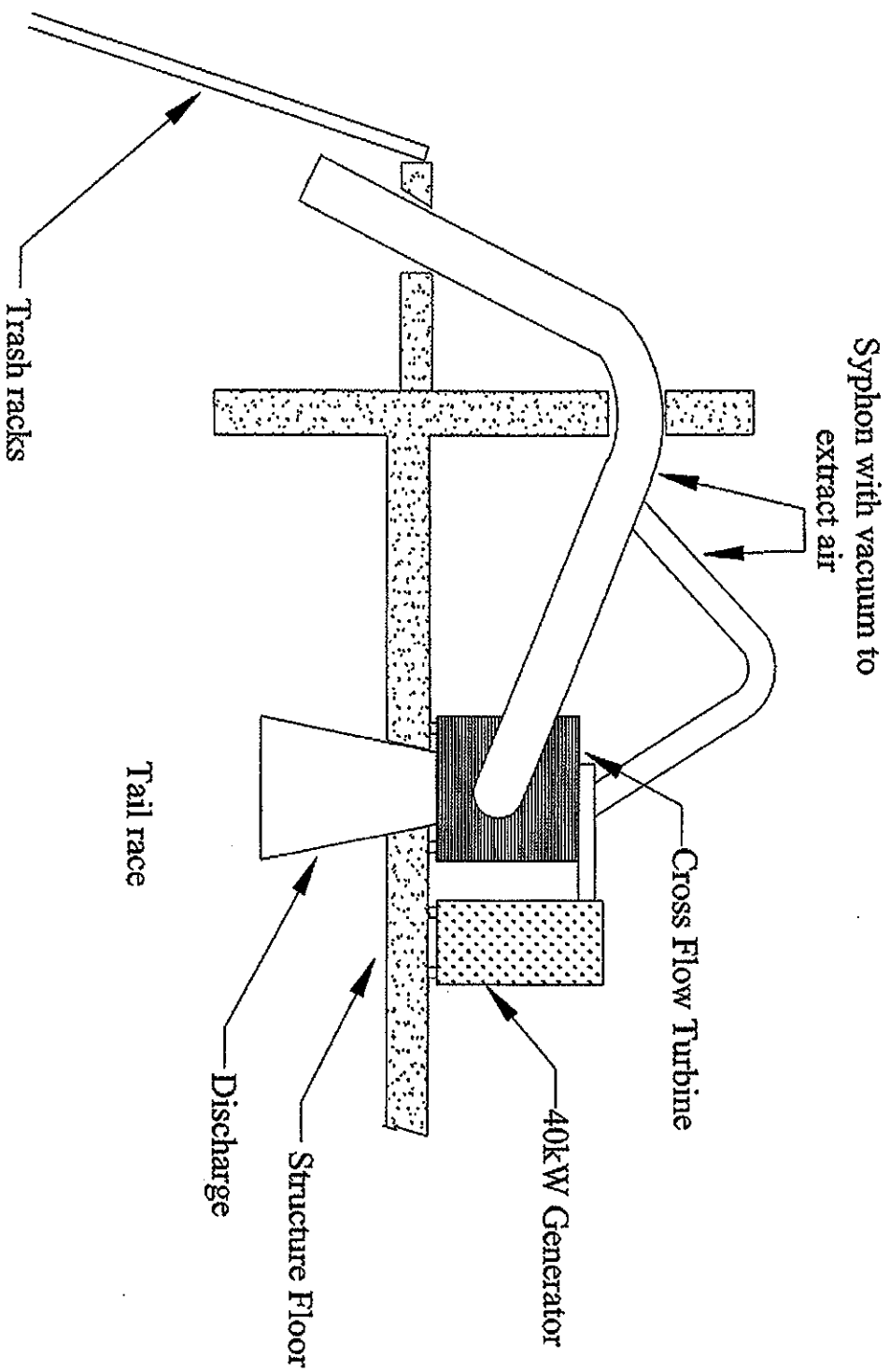
A project assessment was sent to your attention in regards to the City Chetek on 2/1/07. The assessment was based on reinstating and or replacement of the existing equipment as necessary. Flow analysis and licensing was to be by NAH. I have been asked to consider an alternative system for the sole purpose of overall cost reduction.

40 kW Syphon Induction Micro-Hydro Breakdown as follows:

Turbine	\$ 15,000
Generator	\$ 25,000
Electrical	\$ 25,000
Mechanical	\$ 50,000
Syphon Piping	<u>\$ 35,000</u>
TOTAL	\$150,000

This cross flow generator is powered by a basic hydraulic conveyance, a closed-conduit syphon system. The attached diagram illustrates the basic concept behind the steady flow of an incompressible fluid in a pipe, commonly known as a syphon method. Analysis of flow calculation can be provided if this system is determined viable. Despite the careful design needed to produce the best performance, a micro-hydro system isn't complicated. The system is not difficult to operate or maintain. Its lifespan can be measured in decades. Micro-hydro is cost effective for most off grid sites that have a suitable water resource in comparison to wind or solar. However, it is a rare condition that a micro-hydro would be a viable option for commercial application or sale of power.

The original equipment assessment included an estimated rehabilitation at \$430,000 producing 215 net kW. With a calculated viability of approximately \$800,000 over 7 years. There is additional cost for the capitol expenditure, maintenance, insurance etc. However, the equipment was estimated at approximately \$2,000 per kW, where as the equipment cost for this particular micro-hydro will nearly double in cost per kW.



Example of a Syphon System
Cross Flow Generator



